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P. PEILLEX

3,199,882

MANUFACTURING METHOD FOR A SKI AND SKI
OBTAINED BY THIS METHOD
Filed March 11, 1963

Fig. 1

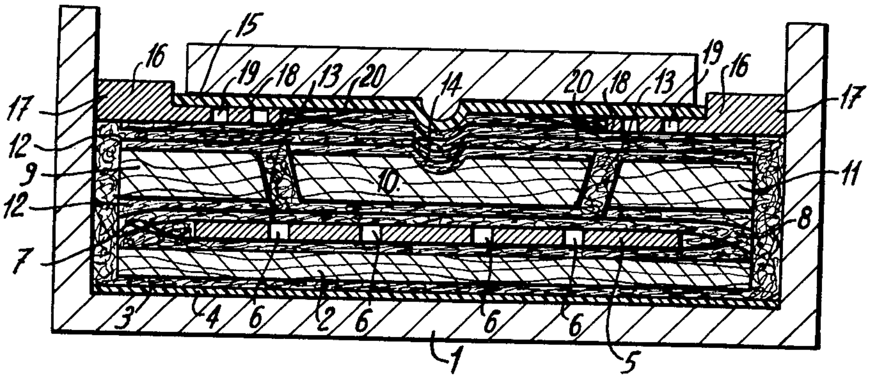


Fig. 2

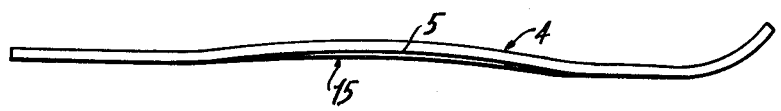


Fig. 3

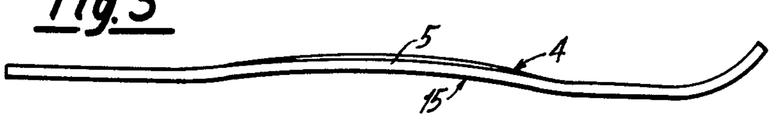
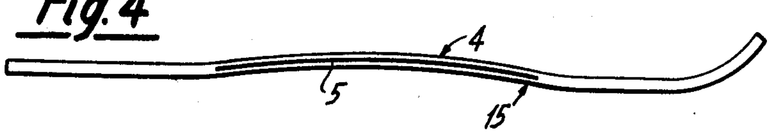


Fig. 4



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1

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MANUFACTURING METHOD FOR A SKI AND SKI OBTAINED BY THIS METHOD

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Numerous methods for the manufacturing of skis are now well-known, especially for the manufacture of skis made out of molded and reinforced synthetic material or for the manufacture of metallic skis. However, the skis made by these methods are not completely satisfactory. In fact, certain of these skis are much too fragile and break easily, others are too flexible or lose very rapidly their elasticity, and this diminishes the quality of the resultant skis. In fact, the requirements now imposed, particularly with regard to skis for competitions, are very high and can practically no longer be met by the known manufacturing methods.

The present invention has for its object a ski which comprises in at least one part of its thickness a cellular zone constituted by elements made of a light material disposed side by side across the width of the ski and extending along at least one part of its length, embedded in a mass of reinforced synthetic material in order to provide a cellular zone in the longitudinal direction of the ski.

The annexed drawing illustrates schematically and by way of example one particular embodiment of the ski according to the invention and certain variants of manufacture of it.

FIG. 1 shows in transverse cross-section the constitutive elements of the ski when compressed by the tightening mold.

FIGS. 2 to 4 show schematically the different possible positions that a stiffening member of the ski is able to occupy.

The manufacturing method for a ski according to the invention consists in providing for at least one zone occupying at least one part of the thickness of the ski in which elements, made of a light material and extending for at least one part of the length of the ski, are disposed side by side across the width of said ski, then embedding these elements in a network of fibers impregnated with synthetic material, and rendering these elements unitary with the network of fibers by solidification of the synthetic material.

According to the method a longitudinal cellular zone is formed, constituted by elements made out of a light material disposed side by side across the width of the ski and extending along at least one part at its length, these elements being embedded in a network of fibers impregnated with synthetic material.

This said cellular zone formed by elements embedded in a mass of reinforced synthetic material may present a height equal to the thickness of the ski. In this case the ski is constituted by only one cellular zone.

However, in the embodiment illustrated the ski comprises, juxtaposed in its thickness, three distinct zones, the one constituted by the said cellular zone which is disposed in the lower part of the ski, an intermedate reinforcing or stiffening zone and a homogeneous zone similar to the said cellular zone but comprising only one element made out of a light material and extending across at least a part of the width and along at least a part of the length of the ski, embedded in a mass of reinforced synthetic material.

These three distinct zones are disposed one against another and then the hardening of the synthetic material is initiated, rendering these zones unitary with each other in

2

order to form practically a monolithic ski. In fact, the synthetic materials of the above-mentioned zones intermingle and form when hardened only one and the same piece of synthetic material.

All the tests made have shown that it was in fact absolutely necessary, in order to obtain a satisfactory ski, that it be monolithic, that is to say that it be constituted by only one piece or by the assembly of several parts interconnected in such a way as to avoid any relative displacement between them. This is necessary in order to obtain a ski having a strength and an elasticity which are lasting and sufficient.

For the manufacture of skis according to the method it is possible to use for the impregnation of the network of fibers a synthetic resin based on polyester, for example, or another plastic resin. It will be necessary, in order to proceed to the hardening of this synthetic material in the position shown in FIG. 1 and corresponding to a transverse cross-section of a finished ski, to effect a treatment depending on the synthetic material used. These treatments are now well-known by persons skilled in the art and will not be described here in further detail. It is evident that for the quantity production of skis the successive operations of disposition of the constitutive elements of the ski in a mold according to a pre-established order, compression of these elements by tightening the mold, and hardening of the synthetic material could be effected automatically in installations which could be easily built to this end by those skilled in the art and familiar with the problems of automatic control and handling.

In the embodiment shown the ski is represented inside a mold 1 used for its manufacture which is generally V-shaped in transverse cross-section. At the inside of the mold presenting the shape which is desired to be given to the ski the constituent elements of the ski are disposed.

The illustrated ski is composed, in fact, of three different parts, a homogeneous upper zone, a stiffening median zone and a cellular lower zone which, when the ski is completed, form a unitary whole.

Referring more particularly to FIG. 1 of the drawing showing a transverse cross-section, such as it is when the ski is completed, the three above-mentioned zones are constituted as follows:

Zone 1. The homogeneous upper zone comprises an element or support 2 made out of a light material, for example wood, compacted sawdust or compacted chips, an expanded or unexpanded plastic material, a thermoplastic or thermosetting material, obtained by extrusion, molding or forming, extending along at least a part of the length and across a part of the width of the ski. This element or support is embedded in a network of fibers 3 impregnated with synthetic material. This homogeneous zone presents thus the general aspect of a mass of synthetic material reinforced by means of a network of fibers, for example a network of glass fibers, in which element 2 is entirely embedded.

This upper part presents further, in the embodiment shown a facing surface 4 extending across the whole width and along the whole length of the ski and which is fixed, for example by glueing on one of the faces of the said upper part. This facing surface is constituted by a sheet of plastic material covered with fabric which may be colored and its glueing on the outside surface of the upper part may be effected during the manufacture of the ski through adhesion to the synthetic material embedding the element 2. This facing surface 4 presents preferably a high hardness and confers to the ski the desired appearance with respect to its color, etc., but it accounts for very little of the technical qualities of strength and elasticity of the ski.

This upper part of the ski is practically subjected to compression stresses only.

Zone 2. The stiffening median zone comprises a metallic core **5** constituted by a metal strip extending along the whole length of the ski and across the greatest part of its width. The core is provided with perforations **6**. Wicks **7**, made out of plated or unplated fiber, impregnated with synthetic materials, are engaged in these perforations **6** in order to be disposed along both faces of the metallic core **5**. In the example shown these perforations are aligned in the transverse direction of the ski and these wicks **7** are disposed in transverse planes of the ski. However, it is evident that the perforations **6** could be aligned in the longitudinal direction of the ski and that these wicks **7** could be located in longitudinal planes of the ski. It is further possible that the perforations **6** could be disposed arbitrarily and that the wicks **7** could follow crooked lines.

In fact, whatever the disposition of these wicks may be the important feature is that these wicks are situated along both sides of the metallic core **5**. This metallic core **5** is provided with its wicks **7** is embedded in a layer **8** of a synthetic material which is reinforced with a network made of glass fibers, for example. The synthetic material impregnating the wicks **7** and the network of fiber forming the layer **8** intermingle in such a way that during the hardening of this synthetic material the wicks **7** and the network of fiber of the layer **8** form a single piece of reinforced synthetic material. In this manner it is possible to effect a close linkage hindering any relative displacement between the layer **8** of the reinforced synthetic material and the metallic core **5**. Further it is recommended to sandblast the metallic core before embedding it in the layer **8** for increasing the adhesion coefficient of the synthetic material forming said layer **8** onto the metal of the core, permiting also the strengthening of the mechanical bond between this layer **8** and the core **5**.

It is, in fact, absolutely necessary, in order to guarantee the quality of the ski, that even during very pronounced bending of the ski no relative displacement between the layer **8** and the core **5** may take place.

The stiffening zone is particularly intended to confer a gerat elasticity to the ski. In fact, the metallic core **5** is fixed in such a way as to hinder any relative displacement of it with respect to the surrounding synthetic material conferring to the ski, taken as a whole, a modulus of elasticity which is near that of the metal constituting the core **5** which is much higher than the one of the mass of synthetic material.

Zone 3. The cellular lower zone of the ski comprises elements or supports **9, 10, 11** made out of a light material similar to the material constituting the element **2** of the homogenous zone, disposed side by side across the width of the ski and extending along the whole length of the ski. These elements **9, 10, 11** are embedded in a synthetic material reinforced with a network of glass fiber, for example. This cellular zone forms a reinforced mass of synthetic material **12** comprising longitudinal partitions **13** separating the elements **9, 10, 11** which are entirely embedded in this reinforced mass of synthetic material.

The median element **10** has a longitudinal groove **14** extending along the greated part of the length of the ski. The ski is further provided on its free lower face with a sliding surface **15** constituted by a sheet of plastic material covered with fabric the composition of which is such that it presents good sliding characteristics. This sliding surface, presenting a hardness lower than that of the facing surface **4**, is fixed by glueing during the manufacture through adherence of the reinforced synthetic material of the envelope **12** onto the plastic material covered with fabric of said sliding surface **15**. In the example shown the lower part of the ski comprises further metallic reinforcements **16** extending on each side of the ski and along the whole or part of its length. These reinforcements **16** comprise an external part **17** of great thickness which may project out of the synthetic material of the ski and contact the ground, and internal part **18** of lesser thickness presenting at least one row of holes **19** distributed along its whole length and intended for the anchorage of supports in the synthetic material of the ski. Wicks **20** of fibers, plaited or unplaited, impregnated with synthetic maerials are engaged in these holes **19** either transversely (as shown) or longitudinally and are thus disposed alternatively on the one and on the other side of this internal part **18** of the reinforcements **16**. The synthetic material of these wicks intermingles with that of the envelope **12** of the lower part of the ski so that after hardening of this synthetic material the reinforcements are unitary with said lower part.

This lower part is particularly intended to resist traction stresses to which it is nearly exclusively subjected. In fact, due to these metallic reinforcements **16**, which are in tension, it is possible to ensure a very high tensile strength in this lower part of the ski.

These three zones are disposed in such a way that the stiffening zone is located between the upper and lower parts of the ski, the facing surface **4** and the sliding surface **15** being respectively located towards the outside of the thus completed assembly. In this way the synthetic material of the layers **3, 8** and **8, 12** of each of the respective zones intermingles enabling to obtain, after the hardening of this synthetic material, a ski formed by elements embedded in only one part of synthetic material thus ensuring a great strength of the assembly.

The ski according to the present invention, fulfilling the necessary condition of being monolithic nevertheless segregates the lower, median and upper parts of it so as to give to each of these parts a configuration determined by the kind of use to which it is subjected.

The practical construction of a ski according to the present invention comprises the following successive operations:

(1) Placing inside a mold the constructive elements of the ski in an order determined by the configuration of the desired ski, that is to say depending on the number of zones and the way in which these zones are related.

(2) Compressing the thus compiled assembly in order that the synthetic material will closely embed all the elements and effect the tight linking of all the zones of the ski.

(3) Hardening the molded material and then unmolding the ski.

(4) Finishing the ski, that is to say emplacing the fittings and the other accessories.

In order to modify the hardness and/or the elasticity of the described ski it is possible to modify the location of the metallic core **5**. FIGS. 2 to 4 show respectively the three possible positions of said core **5**, that is, in the lower part of the ski (FIG. 2), in the upper part of the ski (FIG. 3) or in the median part (FIG. 4).

This core **5** may further present a length approximately equal to that of the ski or a much smaller length in which case this core would be disposed in the center part of the ski. This core may also be constituted by several juxtaposed metallic sheets.

One embodiment of the ski according to the invention has been described by way of example but numerous variants could be foreseen. In particular, the number of longitudinal partitions **13** of the cellular zone could be greater than two. Further these partitions **13** have been shown as inclined with respect to the longitudinal symmetry plane of the ski. However, this inclination is variable and these partitions could be parallel to this said symmetry plane.

Further the described ski comprises three different zones, however, it is possible to provide for skis comprising only one or two different zones. For example, a ski could comprise only one cellular zone presenting a height approximately equal to the thickness of the ski. In another variant a ski could be formed by two zones only, one cellular zone and either a homogeneous zone or a stiffening zone disposed on one or the other side of the cellular zone.

Furthermore, in other variants of a ski comprising three different zones these zones could be juxtaposed in another order than the one described and shown. In fact, the lower part of the ski could be constituted either by the homogeneous zone or by the stiffening zone. In the same way the median and upper parts of the ski could be formed by a cellular or homogeneous zone, and by a cellular or stiffening zone, respectively.

Further, it is also possible in another variant to dispose the metallic reinforcements 16 not only in the lower part of the ski but also in the upper part of the ski. In this case these reinforcements work in compression.

In certain variants the metallic reinforcements 16 could be fitted under the sliding surface 15 and screwed to this surface by means of screws, for example.

Further, it is evident that the cellular zone could comprise longitudinal partitions 13 disposed, no longer in the direction of the thickness of the ski, but in the direction of the width of said ski. A variant could comprise longitudinal partitions 13 disposed in the direction of the thickness of the ski as well as in the direction of the width of the ski.

Further, in certain embodiments the mounting of the ski binding could be fixed or anchored on one of the metallic elements embedded in the mass of synthetic material of the ski.

It thus clearly appears that if one particular embodiment of the ski has been shown and described in detail the scope of the claimed protection is absolutely not limited to this particular form of execution.

In a non-illustrated variant the perforations or the holes provided respectively in the core and in the metallic reinforcements could be constituted by openings having any shape, for example, slots which are open or not, on the

sides of these metallic parts. In fact, it is important in this respect only that the fiber wicks extend along both sides of the corresponding metallic part.

I claim:

1. A ski comprising a plurality of parallel elongated bodies extending lengthwise of the ski in a common horizontal plane and spaced laterally from each other, and resin-bonded glass fiber in the form of a unitary body that surrounds each said elongated body and spaces said elongated bodies laterally apart, said elongated bodies having cross-sectional configurations of substantial extent in all directions, the material of said elongated bodies having a density substantially less than the density of said unitary body.

2. A ski as claimed in claim 1, and a resilient metal strip of substantial thickness embedded in said unitary body above said elongated bodies, and a horizontal flat elongated body extending lengthwise of the ski and embedded in said unitary body above said strip and having a cross-sectional configuration of substantial extent in all directions, the material of said flat body having a density substantially less than the density of said unitary body.

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